Experimental Mid-continent Greater White-fronted Goose Breeding Pair Survey in Northwest Alaska, May 25-28, 2005

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Introduction

The mid-continent population of greater white-fronted geese (*Anser albifrons frontalis*; hereafter white-fronts) breeds in tundra habitats from the central Canadian Arctic to the North Slope of Alaska, and south into boreal habitats of the interior and northwest portions of the state. Throughout their range, white-fronts are an important resource for consumptive and non-consumptive users. In Alaska, white-fronts are particularly important to subsistence hunters, and population and habitat management for the species is an integral component of enactment legislation for several National Wildlife Refuges.

The Management Plan for mid-continent white-fronts geese states that "…special management options for identifiable and manageable segments or subunits within the population could be considered should they be recognized with new information" (Graber in prep). While some characteristics of white-fronts in interior and northwest Alaska could distinguish this group of geese as a unique segment or subunit of the mid-continent population, managers do not have a tool to identify when special management options are warranted. In May, 2005 we conducted a pilot survey to measure breeding pair abundance and distribution of white-fronts in northwest Alaska to determine if this survey could be a useful tool to identify when special management options are needed.

Efforts to monitor white-fronts in interior and northwest Alaska have yielded variable measures of population abundance and trend. Concerns for the status of white-fronts in the interior and northwest portion of the state were raised in the 1990s following reported declines in abundance (Spindler et al. 1999). This decline occurred at a time when population indices on the North Slope of Alaska were stable (Larned et al. 2005, Mallek et al. 2005) and the continental population was increasing (Nieman et al. 2005). Subsequent investigations showed that survival of white-fronts from interior and northwest Alaska was significantly lower than those nesting in tundra habitats (Ely and Schmutz 1999). Researchers also found that timing of migration, and fall and winter distribution were unique among interior and northwest Alaska white-fronts (Ely and Schmutz 1999, Spindler and Webb 2003) possibly putting them at disproportionate sport harvest mortality in some locations in Canada, Texas and Mexico. On a continental scale, the population index of mid-continent white-fronts declined substantially between 2000 and 2005 from over a million birds to 522,800 (Nieman et al. 2005).

The effects of low survival on white-front abundance in Alaska cannot be adequately assessed with current surveys. Fall staging surveys do not reflect abundance or trend of the Alaska breeding component because white-fronts from all segments of the breeding range mix together in the survey area. Within Alaska, aerial molting goose surveys have been conducted on the Koyukuk NWR since 1994 (Spindler et al. 1999, Bryant 2004) and Innoko, and Selawik NWRs since 2000 (Fischer 2005). Population trends from these surveys are equivocal and are likely dependent on parameters currently not monitored. For example, the molt survey primarily monitors molt migrants; but molt

migration in geese involves non-breeders or failed breeders (Salomonsen 1968, Hohman et al. 1992) with highest numbers expected at molt sites in years of poor breeding success (Reed et al. 2003). Thus, abundance estimates derived from molt surveys are greatly biased by current breeding success.

An alternative method of monitoring population trend is with breeding pair surveys. Biologists and waterfowl managers have long recognized the value of breeding ground surveys when regional or population specific indices of geese are needed (Kaminski 1979, Bishop and Williams 1990, Kraft and Funk 1990, Rusch et al. 1996, Abraham et al. 1999, Moser and Caswell 2003). Experimental breeding pair surveys for the Eastern Prairie Population of Canada Geese showed that such surveys were a useful alternative to staging or winter surveys and produced reasonable population estimates with relatively narrow confidence intervals (Malecki et al. 1981, Rusch et al. 1996).

Abundance and trend of waterfowl breeding populations are currently monitored in interior and northwest Alaska during the Continental Waterfowl Breeding Population and Habitat Survey (hereafter, "Continental Survey"), but the method is not designed specifically to monitor geese. Instead, the Continental Survey is timed to correspond with nest initiation and early incubation of ducks (Smith 1995), and is not optimal for geese because sightability of white-fronts decreases significantly in boreal habitats after nest initiation (Spindler, pers. comm.). The Continental Survey samples the Kotzebue Sound stratum (northwest Alaska) in early June (unpubl. FWS data; mean June 9, 1964-2005), approximately four weeks after white-fronts have arrived in the region (Shepard 1956, Kessell 1989, Spindler and Hans 2005, unpubl. FWS satellite data). We designed an experimental breeding pair survey in 2005 to develop an improved index for the white-front breeding population in northwest Alaska.

Methods

To design the experimental survey we used white-front breeding population data collected during the 1996-1997 expanded breeding pair survey effort (Platte 1999). The expanded breeding pair surveys were conducted in early to mid June to collect detailed distribution data within waterfowl production areas that are sampled annually during the Continental Survey. Transect design in 2005 was nearly identical to the 1997 expanded breeding pair survey of Selawik NWR and the Noatak Lowlands (Platte 1999; Fig. 1). One exception was that the Baldwin Peninsula stratum was excluded from the 2005 survey because no white-fronts were observed there in 1997. This design resulted in 1,900 km of transects comprising a sample of 761 km^2, approximately 5% of the 14,848 km^2 study area. The survey was flown from May 25-28, 2005.

The crew used the Selawik NWR Husky on wheels as a survey platform. Birds within 200m of either side of the aircraft were recorded by Paul Anderson (Pilot/Biologist; left side observations), and Tina Moran (Wildlife Biologist; right side observations). They used MBM customized aerial survey software to record all goose, scoter, swan, and loon observations. Numbers of geese were recorded and observations were categorized as singles, pairs, or flocks. Standard headers were recorded at the onset of each transect including: observer name, date, transect number, wind speed, wind direction, sky condition (clear, scattered, broken, overcast), and snow cover (<10%, 11-50%, 51%- 90%, >90%).

Analysis methods followed ratio estimation procedures (Cochrane 1977) outlined for expanded breeding pair surveys in northwest Alaska (Platte 1999). We assumed single birds were accompanied by a mate on a nest that was not visible to the observer. Thus, the number of indicated pairs was calculated by two times the number of singles plus the number of paired birds. The number of total indicated birds was calculated as indicated pairs plus flocked birds.

Results and Discussion

Estimates of white-front density, number of indicated pairs, and total birds is presented in Table 1. The survey yielded an estimate of 6,685 total indicated white-fronts, of which 2,160 were indicated pairs (Table 1). Relative to the 1996-1997 surveys, the estimate of pairs was highest in 2005 but indicated total was lowest. Distribution of geese in 2005 was similar to previous surveys with highest goose densities in the "Selawik" stratum (Table 1, Fig. 2).

Maximizing the proportion of indicated pairs to indicated totals would indicate a survey timed appropriately for indexing the breeding population. Poor timing of breeding pair surveys could result in biased estimates of flocked birds if pre-breeding geese are passing through the area en route to more northerly areas, or if local or migrant geese are staging in the study area after failed nesting attempts. The effect of timing bias on breeding pair estimates is evidenced in the negative correlation between proportion of total indicated birds that are pairs, and date of survey (Fig. 3). For example, in 1996 when the survey occurred late (June 20) the proportion of pairs was low (11%), whereas in 2005 the earliest timed survey (midpoint May 27), the proportion of pairs was high (32%). In 1997 both the timing and proportion of pairs were intermediate to the other years (June 6, 18% pairs). This correlation suggests that June is too late in the season to monitor white-front breeding pairs. Three years of surveys is insufficient to determine whether the correlation is consistent over the long-term, but the relationship deserves closer examination if surveys are continued in the future.

While the 1996 and 2005 surveys were conducted over three weeks apart, the 1997 and 2005 surveys were just 10 days apart, and may be more comparable. The estimate of indicated pairs in 1997 and 2005 was essentially the same. While the number of indicated total geese was down in 2005 from 1997, the 95% confidence intervals overlapped, suggesting no significant change.

The pair index, rather than total geese, may be a more useful measure to track change. Estimates of indicated total birds are more variable than indicated pairs in breeding pair surveys of Pacific white-fronted geese on the Yukon-Kuskokwim Delta, possibly due to factors such as survey timing, visibility or habitat conditions (Eldridge et al. 2005). Similarly, total indicated bird estimates are more variable than indicated pairs in the Continental Survey (USFWS unpubl. data). For example, total indicated white-fronts in the Kotzebue Sound stratum (same area as the Selawik stratum of the current study) jumped from 6,600 in 1997 to 28,100 in 1998 (USFWS unpubl. data).

Within the survey area, differences in density and abundance of pairs and total geese were evident. In all three years, the highest density and abundance estimates were seen in the Selawik stratum. The Noatak and Deltas strata also had relatively high densities, but the overall contribution to population estimates was minimal given the

smaller total size of those strata. The relatively consistent distribution should be taken into consideration when modifications to the survey design are considered in 2006.

The white-front survey should be repeated in 2006 to determine whether this specialized survey is necessary to monitor breeding populations in northwest Alaska. Although white-fronts are currently monitored in northwest Alaska through the Continental Survey, this survey may not provide an accurate index to the breeding population. The Continental Survey flight lines in the Selawik area are just 16% of the transect length of the experimental white-front survey lines. Despite the smaller sample of habitat in the Continental Survey, the breeding pair estimates from the two surveys are surprisingly close (Fig. 4). An additional year of data from the experimental survey may help determine whether the white-front population in northwest Alaska can be adequately monitored with the Continental Survey alone.

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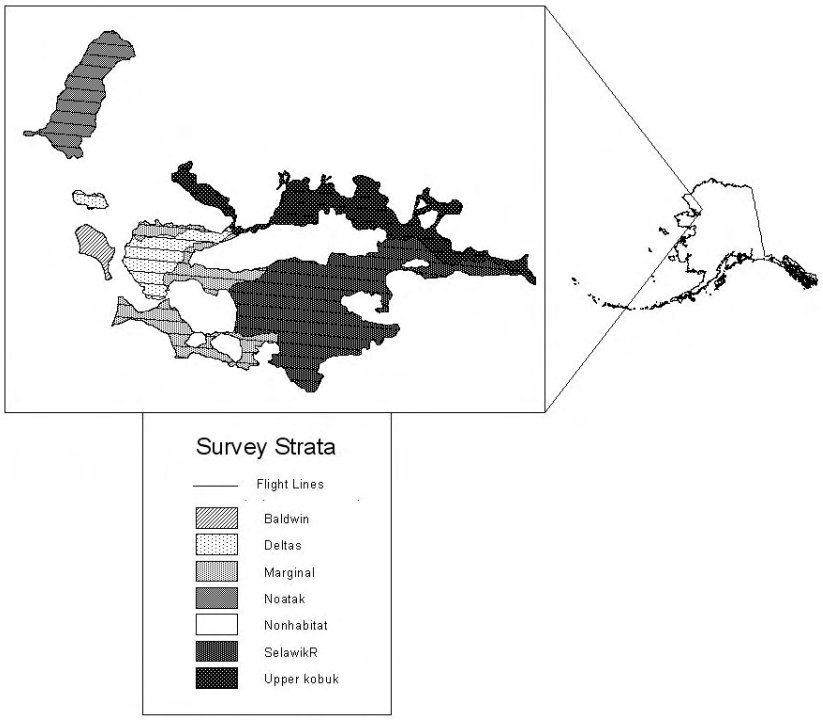

Figure 1. Location of experimental white-fronted goose breeding pair survey, northwest Alaska, May 25-28, 2005.

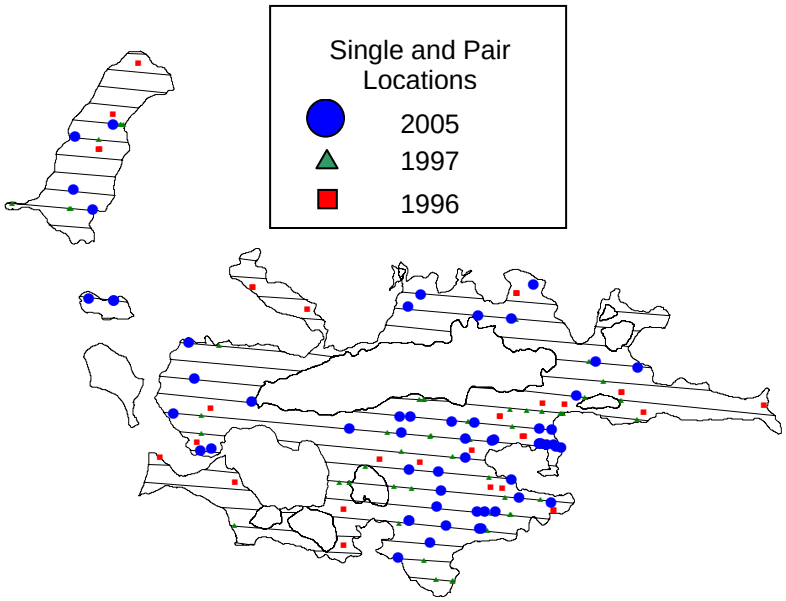

Figure 2. Location of indicated white-front pairs (singles and pairs) during breeding pair surveys in 1996, 1997, and 2005.

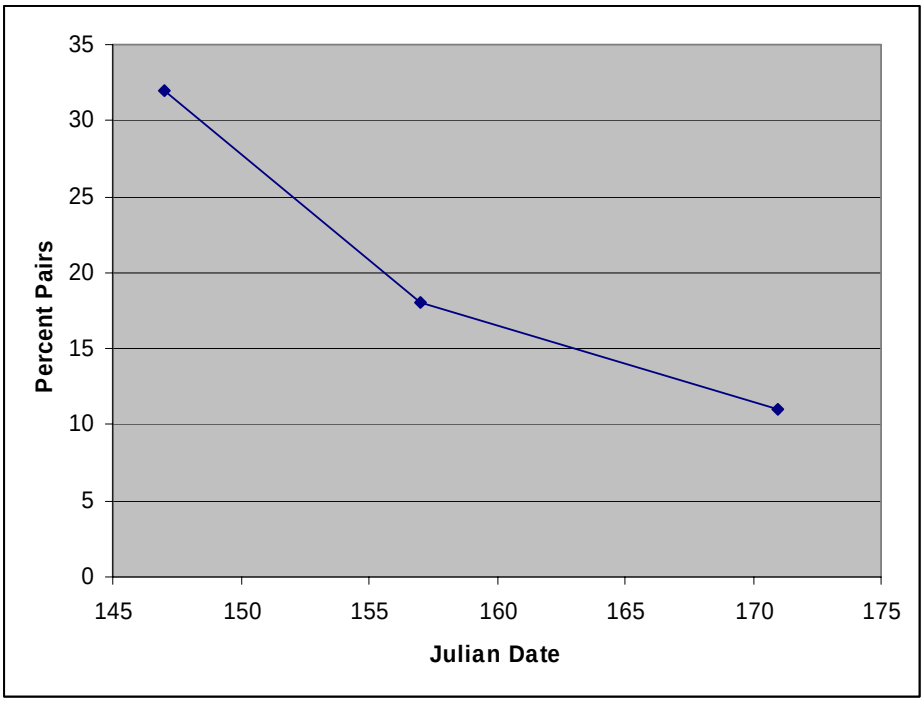

Figure 3. Relationship between survey date (Julian date) and percent of total white-fronts that were seen as indicated pairs, 1996, 1997, 2005.

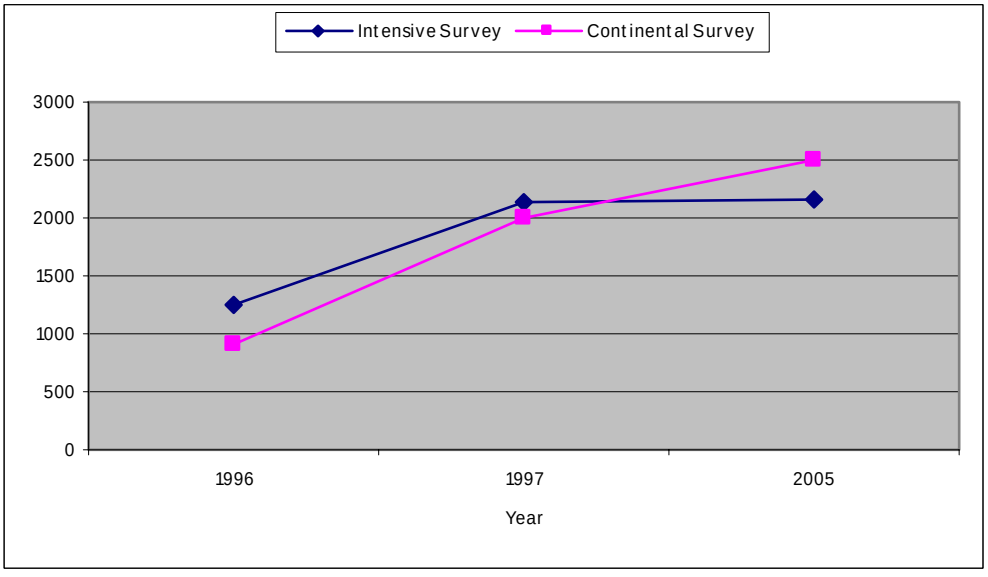

Figure 4. Comparison of indicated pairs estimated during the intensive surveys (expanded BPS 1996-1997, and experimental survey 2005), and the Continental Survey.

Table 1. Estimates of indicated pairs and indicated total mid-continent greater white-fronted geese in northwest Alaska, May, 2005 (this study), and June 1996-1997 (Platte 1999). Indicated pairs was calculated by two times the number of singles plus the number of paired birds; total indicated birds was calculated by indicated pairs plus flocked birds.

			Indicated Pairs					Indicated Total				
Stratum Name	Statum Size (km^2)	Year	Mean Density	SE	Population	SE	95%CI	Mean Density	SE	Population	SE	95%CI
Noatak	1896	1996	0.08	0.04	151	85	167	0.68	0.23	1280	442	866
		1997	0.15	0.09	292	167	327	1.11	0.32	2099	598	1172
		2005	0.08	0.03	150	59	115	0.39	0.14	729	261	511
Deltas	1413	1996	0.05	0.04	75	52	102	0.11	0.06	150	89	174
		1997	0.08	0.04	113	63	123	0.20	0.15	283	218	427
		2005	0.19	0.10	268	141	277	0.28	0.14	401	201	394
Marginal	2207	1996	0.05	0.03	117	67	131	0.49	0.28	1072	625	1225
		1997	0.03	0.02	71	44	86	0.03	0.02	71	44	86
		2005	0.03	0.02	75	51	100	0.32	0.20	695	442	866
Upper Kobuk	3255	1996	0.08	0.04	254	135	265	0.70	0.31	2264	1019	1997
		1997	0.05	0.04	174	122	239	0.58	0.23	1892	752	1474
		2005	0.10	0.04	317	118	231	0.27	0.11	882	355	696
Selawik	6076	1996	0.11	0.02	655	97	190	1.12	0.35	6785	2106	4128
		1997	0.25	0.04	1496	231	453	1.22	0.26	7411	1588	3112
		2005	0.22	0.06	1351	335	656	0.66	0.11	3977	694	1360
Total	14848	1996	0.08	0.01	1252	205	402	0.78	0.17	11552	2463	4827
		1997	0.14	0.02	2147	320	627	0.77	0.12	11756	1869	3663
		2005	0.15	0.03	2160	390	764	0.45	0.06	6685	954	1871